

What Is Claimed Is:

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1. A method of operating a solid-state image sensing apparatus having pixels each including a photoelectric conversion element, a field effect transistor whose gate receives photo-charge generated by said photoelectric conversion element, and a transfer switch for controlling connection between said photoelectric conversion element and the gate of said field effect transistor, wherein

transference of the photo-charge from said photoelectric conversion element to the gate of said field effect transistor is performed under a condition that a channel is formed under the gate of said field effect transistor.

2. The method of operating the solid-state image sensing apparatus according to claim 1, wherein said field effect transistor is operated in a triode region during the transference of the photo-charge from said photoelectric conversion element to the gate of said field effect transistor.

3. The method of operating the solid-state image sensing apparatus according to claim 1, wherein said field effect transistor is operated under a condition

that a gate voltage of said field effect transistor is greater than a sum of a source voltage and a threshold voltage of said field effect transistor during the transference of the photo-charge from said photoelectric conversion element to the gate of said field effect transistor.

4. The method of operating the solid-state image sensing apparatus according to claim 1, wherein said field effect transistor is operated under a condition that a gate voltage of said field effect transistor is greater than a sum of a drain voltage and a threshold voltage of said field effect transistor during the transference of the photo-charge from said photoelectric conversion element to the gate of said field effect transistor.

5. The method of operating the solid-state image sensing apparatus according to claim 1, wherein the solid-state image sensing apparatus has a selection switch for controlling connection between a drain of said field effect transistor and a fixed voltage source, wherein

said selection switch is controlled to be off during the transference of the photo-charge from said

photoelectric conversion element to the gate of said field effect transistor.

6. The method of operating the solid-state image  
5 sensing apparatus according to claim 1, wherein the solid-state image sensing apparatus has a selection switch for controlling connection between a source of said field effect transistor and an output line, wherein  
10 said selection switch is controlled to be on during the transference of the photo-charge from said photoelectric conversion element to the gate of said field effect transistor.

7. The method of operating the solid-state image  
15 sensing apparatus according to claim 1, wherein the solid-state image sensing apparatus has a source of fixed current for providing current to a source of said field effect transistor, wherein

the source of said field effect transistor and said  
20 source of fixed current is connected during the transference of the photo-charge from said photoelectric conversion element to the gate of said field effect transistor.

8. The method of operating the solid-state image  
25 sensing apparatus according to claim 1, wherein the

solid-state image sensing apparatus has a fixed voltage source for applying a source of said field effect transistor, and a switch arranged between the source of said field effect transistor and said fixed voltage source, wherein

the source of said field effect transistor and said fixed voltage source is connected during the transference of the photo-charge from said photoelectric conversion element to the gate of said field effect transistor.

9. The method of operating the solid-state image sensing apparatus according to claim 1, wherein said photoelectric conversion element is a photodiode, and said photodiode is depleted after the transference of the photo-charge from said photoelectric conversion element to the gate of said field effect transistor.

10. A solid-state image sensing apparatus comprising:

a plurality of pixels each including a photoelectric conversion element, a field effect transistor whose gate receives photo-charge generated by said photoelectric conversion element, and a transfer switch for controlling connection between said

photoelectric conversion element and the gate of said field effect transistor; and

control means for controlling that transference of the photo-charge from said photoelectric conversion element to the gate of said field effect transistor is performed under a condition that a channel is formed under the gate of said field effect transistor.

11. The solid-state image sensing apparatus according to claim 10, wherein said control means controls said field effect transistor to operate in a triode region during the transference of the photo-charge from said photoelectric conversion element to the gate of said field effect transistor.

12. The method of operating the solid-state image sensing apparatus according to claim 10, wherein said control means controls said field effect transistor to operate under a condition that a gate voltage of said field effect transistor is greater than a sum of a source voltage and a threshold voltage of said field effect transistor during the transference of the photo-charge from said photoelectric conversion element to the gate of said field effect transistor.

13. The method of operating the solid-state image sensing apparatus according to claim 10, wherein said control means controls said field effect transistor to operate under a condition that a gate voltage of said field effect transistor is greater than a sum of a drain voltage and a threshold voltage of said field effect transistor during the transference of the photo-charge from said photoelectric conversion element to the gate of said field effect transistor.

14. A solid-state image sensing apparatus comprising:

a plurality of pixels each including a photoelectric conversion element, a field effect transistor whose gate receives photo-charge generated by said photoelectric conversion element, a first switch for controlling connection between said photoelectric conversion element and the gate of said field effect transistor, and a first reset means for resetting the gate of said field effect transistor, and output lines for transferring an output from said field effect transistors;

load means, provided on said output lines, for said field effect transistors; and

second reset means for resetting said output lines to a predetermined voltage.

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15. The solid-state image sensing apparatus according to claim 14, wherein said predetermined voltage is ground voltage.

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16. The solid-state image sensing apparatus according to claim 14, further comprising a first capacitor for temporarily storing an output from said field effect transistor transferred to said output line; and

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a second switch for controlling transference of the output from said output line to said first capacitor.

17. The solid-state image sensing apparatus according to claim 14, further comprising:

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a first capacitor for temporarily storing an output from said field effect transistor reset by said first reset means;

a second switch for controlling transference to said first capacitor;

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a second capacitor for temporarily storing an output from said field effect transistor after said photoelectric conversion element and said field effect transistor are connected via said first switch ; and

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a third switch for controlling transference to said second capacitor.





said output lines are reset by said second reset means in advance of connecting of said photoelectric conversion element and the gate of said field effect transistor.

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21. The method of operating the solid-state image sensing apparatus according to claim 20, wherein the solid-state image sensing apparatus further comprises a first capacitor and a second capacitor connected to each of said output lines, a second switch for controlling connection between said output line and said first capacitor, and a third switch for controlling connection between said output line and said second capacitor, further comprising the steps of:

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transferring a first voltage, outputted from said field effect transistor reset by said first reset means, to said first capacitor via said second switch; and

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transferring a second voltage, outputted from said field effect transistor after the photoelectric conversion element and the gate of said field effect transistor are connected via said first switch, to said second capacitor via said third switch.

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22. The method of operating the solid-state image sensing apparatus according to claim 20, wherein said solid-state image sensing apparatus further comprises a

fourth switch, arranged between said field effect transistor and a power supply, for selecting a row, further comprising

5 a step of transferring an output from said field effect transistor to said output line by turning on said fourth switch.

23. The method of operating the solid-state image sensing apparatus according to claim 20, wherein said  
10 solid-state image sensing apparatus further comprises a fourth switch, arranged between said field effect transistor and said output line, for selecting a row, further comprising

15 a step of transferring an output from said field effect transistor to said output line by turning on said fourth switch.

24. The method of operating the solid-state image sensing apparatus according to claim 20, wherein said  
20 photoelectric conversion element is a photodiode, and said photodiode is depleted after the transference of the photo-charge from said photoelectric conversion element to the gate of said field effect transistor.